UNIVERSITY OF NEBRASKA
STATE MUSEUM

# Plate Boundaries - Where the action is!

## Modeling Activity

*The Earth's outer shell, called the lithosphere, is broken up into tectonic plates. The lithosphere is rock that is rigid and brittle - it is composed of the crust and the uppermost mantle. The rigid plates move around on top of a hotter more mobile layer of the mantle known as the asthenosphere. Where the plates meet is where most of the world's earthquakes and volcanic activity occurs. Let's explore what happens at different plate boundaries.*

### What you need:

- Graham crackers
- Waxed paper
- Peanut butter or frosting and a knife to spread
- Small bowl of water

PUSH

PULL

### Set up:

- Spread peanut butter or frosting on the waxed paper. Cover an area almost twice the size of a whole graham cracker. This is the asthenosphere – soft and mobile.
- Break a graham cracker in half, now you have two tectonic plates. The plates are rigid and brittle. When you broke the graham cracker... you caused an earthquake!

### What you'll do:

Place two graham cracker halves (tectonic plates) on your asthenosphere. Using one finger on each plate, very slowly and gently move your plates around on the asthenosphere. This is how tectonic plates on the Earth's asthenosphere move. Now let's check out the different types of boundaries between plates.

**Divergent Plate Boundary**

These are boundaries where two plates move away from each other. These boundaries are often found on ocean floors.

Put the two graham cracker halves (tectonic plates) touching each other in the middle of your asthenosphere. Using two fingers (one on each cracker) gently push the crackers away from each other so the asthenosphere is visible in between your plates. You have just created a rift or a crack in the ocean floor. As the plates separate, magma (melted rock) oozes up forming a ridge, which creates mountains on the ocean floor over millions of years. The Mid Atlantic Ridge goes down the center of the north and south Atlantic Oceans and is a divergent plate boundary.

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**Transform Plate Boundary**
These are boundaries where two plates move past each other.

Put your graham crackers side by side again, so they are touching. Now, with two fingers on each cracker, slowly move one cracker away from you and the other cracker toward you. Keep the crackers right up against each other as you move them. You may notice that sometimes the crackers seem to get stuck and then move forward again. That is what happens along a transform fault. The plates get stuck and then suddenly lurch forward – resulting in an earthquake. The San Andreas Fault is a transform boundary – the western plate (Pacific Plate) is moving northwest and the eastern plate (North American plate) is moving southeast.

**Convergent Plate Boundary** - oceanic crust and continental crust
These are boundaries where the two plates run into each other. Oceanic crust is heavier/denser than continental crust so, the denser crust will be subducted, or go underneath the lighter, less dense crust.

Slowly push the two plates together making one slide underneath the other for about a half inch or so. The plate that went underneath is made of the dense oceanic crust and was subducted. The plate on top is the less dense continental crust. As the oceanic plate goes downward, it often gets stuck and then suddenly releases causing an earthquake. As the oceanic plate goes deeper it will start to melt from the intense heat and pressure. This new magma will float up slowly through the plate above and eventually become a volcano and erupt like Mount St. Helens in Washington state.

**Convergent Plate Boundary** – continental crust meets continental crust
These are boundaries where two plates of continental crust of the same density run into each other.

Take one graham cracker half and very quickly dip ½ inch of the cracker in water and place the cracker on your asthenosphere. Do the same thing with the other cracker half, placing it on the asthenosphere so the two wet portions touch. Now slowly push the two tectonic plates together. The ridge you formed is like some mountain ranges on Earth that have formed over millions of years as the two plates made of crust, that is the same density, crumpled together. The Himalayan Mountains formed when the Indian continental plate crashed into the Asian continental plate.

**Earthquake!**
The plates at divergent, transform and convergent boundaries are moving very slowly ranging from 1 to 6 inches a year, so we do not notice the creeping movement. Often a tectonic plate gets stuck, and eventually, pressure builds up and the plate is released, causing an earthquake! Plate tectonics helps us understand how some earthquakes and volcanic activity occur and how the landscapes we see on Earth formed.